ABSTRACT OF THE DISCLOSURE

Oxygen is doped in a quantum well active layer. First, an n-type $In_{0.02}Ga_{0.98}N$ barrier layer 550 of 10 nm is formed by supplying TMG at 10sccm, TMI at 30sccm, O_2 at 20 sccm, and NH_3 at 10 slm, on the n-type GaN optical guide layer 405. Next, a molar flow rate of TMI is increased to 50sccm, and an undoped $In_{0.2}Ga_{0.8}N$ well layer 553 of 3 nm is formed. This process is repeated three cycles, and finally, the process is completed with the n-type $In_{0.02}Ga_{0.98}N$ barrier layer 550. A p-type $Al_{0.2}Ga_{0.8}N$ cap layer 407 whose thickness is 20 nm is formed by supplying TMG at 15 sccm, TMA at 5 sccm, and $(EtCp)_2Mg$ at 5 sccm and NH_3 at 10 slm, on a multi-quantum well structure active layer 420 formed in this way.